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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Development of Efficient and Environmentally Acceptable Tsetse and Tick Control Technology for the Developing Countries of the Tropics - the International Centre of Insect Physiology and Ecology (ICIPE) (GLO/90/006)

Recommendation of the Administrator

Estimated UNDP contribution:	$6,200,000
Duration:	Five years
Executing agency:	UNDP in association with World Bank and FAO

I. BACKGROUND

1. The International Centre of Insect Physiology and Ecology (ICIPE) was established in Nairobi, Kenya, in 1970 on the initiative of a group of eminent entomological scientists. It serves as a resource base for fundamental studies on the physiology and ecology of insects of world-wide economic importance. ICIPE brings together diverse scientific talents from developed and developing countries to pursue advanced research under the guidance of eminent scientists, making maximum use of the natural and human resources of developing countries. By providing basic knowledge of the biology of several groups of pests important in many developing countries, it enables them to develop practical integrated pest

best copy available

control systems which will minimize the economic damage of insecticide residues on human populations and their environment.

2. Since the early 1970s, the United Nations Development Programme (UNDP) has been assisting ICIPE in its research and training programmes. The general objectives of the current project are to:

(a) Continue to seek new knowledge that will lead to the development of long-range, effective and environmentally acceptable pest management techniques;

(b) Continue to collaborate closely with the international agricultural research centres, and to strengthen the co-operative linkages of ICIPE with the national programmes in tropical countries and applied research institutions, in order that ICIPE research results can be incorporated effectively into experimental and pilot schemes for pest control;

(c) Help build up human resources in the field of pest management research and practice in Africa and other tropical regions through training and study workshops.

3. The continued financial assistance of UNDP is helping to support ICIPE in the further development and dissemination of information gained on pest biology and ecology for better pest management. The primary focus of the ongoing project is placed on the application of research results for the benefit of small farmers. Thus far, ICIPE research has pointed out some significant paths for innovative pest management which need intensified investigation and development. This project will also undertake demonstrations of the different components once they are combined into coherent integrated pest management strategies for the crop and livestock pests and disease vectors.

4. Over the years, ICIPE has made substantial progress in the understanding of the biology and ecology of major insect pests in tropical Africa. It is now recognized as a respected international scientific institution, staffed predominantly by African scientists. The information generated by ICIPE scientists has been utilized for the establishment of a network in several African countries where field trials are being conducted in collaboration with national scientists.

5. Through the use of integrated pest management (IPM) strategies, ICIPE has now demonstrated the potential for a viable, sustainable management of two of the major vectors of the livestock diseases in the tropics: tsetse flies and ticks. Studies on tsetse ecology and behaviour, particularly host-seeking behaviour, have led to the development of an odour-bait trapping technique whose pilot trial results are impressive: 90-99 per cent population suppression of one of the major tsetse species. This trap technology has proved to be of great utility among livestock-keeping communities in the areas where it is applied with their participation. In addition to being technically efficient, this tsetse super trap is cheap, easy to make and environmentally sound. Further, studies on population dynamics, tsetse reproductive biology and disease-vector/animal-host relationships are likely to lead to an improved trapping efficacy with a consequent decrease in the transmission of trypanosomiasis.

6. The research thrust on ticks, to date, has clearly demonstrated the feasibility of an integrated tick control methodology that makes use of ecological, immunological, and tick population dynamics as well as disease-vector/animal-host relationships and traditional livestock management knowledge. A major component of this strategy has been to demonstrate the feasibility of host vaccination as a major means of achieving tick control. Thus far, considerable progress has been made towards the development of an anti-tick vaccine which, together with ecological (including population modelling), biological and traditional management-based strategies is intended to contribute significantly to efforts being made by other institutions in the domain of tick management. This integrated approach holds great promise, particularly in view of the advances being made in research on vaccines and drugs against the disease by institutions such as the International Laboratory for Research on Animal Diseases (ILRAD) and others.

7. In the area of human resource development, UNDP support has been instrumental in ICIPE's successful education and training programmes. At leadership level, more than 30 students from 9 different countries in Africa have completed Ph.D. training through the African Regional Post-graduate Programme in Insect Science (ARPPIS) and returned to serve in the universities or research institutions. More than 460 scientists from 41 countries in Africa, Asia and South America have benefited from specialized group training courses on new advances in insect science and pest management. In addition to these, ICIPE has, since 1973, organized more than 30 scientific meetings attended by more than 2,000 participants from all over the world. Through exchange of knowledge, these meetings have contributed towards better understanding of insect pest problems in the tropics.

8. The project being proposed will build on these achievements as it pursues the twin goals of interactive technology development and application and human resource capacity-building. The previous UNDP-supported projects at ICIPE provided a wealth of scientific knowledge of significance to the conservation of the environment, while for this project the accent will be on joint technology "testing" and development with the users, with greater focus on tsetse and tick control technologies.

II. THE PROJECT

9. In order to achieve the long-term goal of increased livestock productivity, this project seeks to reduce the incidence of both tsetse-transmitted and tick-borne diseases through sustainable vector control. Thus the specific objectives of this project are:

(a) For tsetse: to improve the efficacy of the tsetse super trap; to prevent re-invasion of tsetse into controlled areas; to develop a reliable intelligent geographic information system (IGIS) for use in the monitoring of tsetse movement and population dynamics; and to undertake socio-economic studies;

(b) For ticks: to develop an anti-tick vaccine; to investigate the potential of the "anti-tick pasture" concept and tick trap: to develop dragon-flies and indigenous chickens as biocontrol agents and to develop a mathematical tick populations model;

(c) To strengthening the scientific capability of the national agricultural research and extension services of collaborating countries through training and interactive research.

10. As ICIPE continues to translate the large body of accumulated knowledge into technology, mission-oriented basic research will continue to play an important role in providing backstopping support in specialized areas of research and development. At present, four research units provide this crucial support: Chemistry and Biochemistry, Sensory Physiology, Cell Biology, and Biomathematics. Additionally, the Social Science Interface Research Unit provides a framework for a participatory approach in the process of technology design, from development to application.

11. Experience during the past several years at ICIPE has attested to the crucial role of this network of research support units within ICIPE in helping to provide special insights in programme research problems and assisting in the development of innovative technologies for pest management. Further, the structure embracing core programmes and support units brings together a multidisciplinary team of scientists in which programme research interacts closely and continuously with chemical ecology, cellular and molecular biology, sensory physiology, arthropod behaviour, and development of appropriate insect pest management.

12. During the next five years, ICIPE intends to strengthen the interactive research and training thrust through at least five elements:

(a) Wider interactive network activities which will be facilitated by the ICIPE-sponsored Pest Management Research and Development Network (PESTNET) within Africa, Asia and South America;

(b) Leadership training in insect science and pest management, to be implemented by the very successful and innovative ARPPIS, based at ICIPE;

(c) Post-doctoral research fellowship programmes as well as research "associateship" and professional fellowship schemes;

(d) Research management training to be implemented through the ICIPE-sponsored Financial and Administrative Management of Research Projects in Eastern and Southern Africa (FAMESA);

(e) Specialized group training courses for practitioners and front-line staff from national agricultural research and extension services.

13. ICIPE will continue and extend its co-operative research and development activities with ILRAD, the International Livestock Centre for Africa (ILCA), the United Nations Environment Programme (UNEP), the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO) and the International Atomic Energy Agency (IAEA) and national programmes in Africa, Asia and South America. Similar training programmes will be expanded beyond Africa to increase the participation from Asia and South America.

14. In addition to these activities, it is envisaged that information documentation and exchange will constitute an important instrument of training and co-operative linkages. It is for this reason that PESTNET plans, during the five-year project period, to establish a regional pest management and information systems service as an information exchange mechanism.

15. The ICIPE Governing Council is advised by the Programme Committee on scientific policy. The Programme Committee reviews annually, at the annual research conference, the progress of research and training activities. Representatives of UNDP, FAO, WHO, IAEA and UNEP as well as national programmes and other donors are usually invited to the annual research conference to review the progress of research and its impact and to advise on future research thrust. Internally, ICIPE monitors the progress of each research project by annual staff peer reviews and more importantly through internal research review by external assessors. The Support Group for ICIPE (SGI), which is a consortium of ICIPE donors, appoints every three to four years an external team to review ICIPE scientific progress as well as its management. The third external review is being undertaken in February/March 1990 and the fourth one will be held in 1993 or 1994. Finally, ICIPE is host to international study workshops to review its projects with experts from all over the world. One such workshop was held in December 1989 and its recommendations on programme thrust and networking form the basis of this project proposal.

16. UNDP will provide funds for the following: six senior scientific staff; two senior staff for training and networking; equipment and supplies; training costs including post-doctoral research fellowships, post-graduate scholars and training of technologists; and conferences and workshops.

17. UNDP direct costs will be used for financing end-of-project evaluations and contingencies to be made available for special workshops and closely related activities to facilitate inter-institutional and intercountry co-operation. These will be considered strictly on merit on a case-by-case basis and subject to availability of funds.

18. The proposed UNDP contribution is $6,200,000 of which $5,900,000 will be for sub-contracts, while direct costs will account for the remaining $300,000. Financial provision will be made under the direct cost component for the participation of specialists from FAO, WHO and other agencies in project advisory committee meetings, in-house reviews and to render other types of assistance which may be required by ICIPE. Details of this collaboration would be worked out between ICIPE and agencies concerned, and the actual costs incurred would be reimbursed directly by UNDP.

19. The Administrator intends, through contractual arrangements between ICIPE and UNDP, to entrust the implementation of this project to ICIPE with the clear understanding that the Directorate of ICIPE will seek the advice of FAO on technical aspects of the project. In consultation with FAO and other agencies concerned, UNDP will make a concerted effort to link the activities to be undertaken at the country and intercountry levels. A review of all ICIPE research and training programmes is made each year at the annual research conference in

June, when practical and urgent questions of pest control receive the careful attention of scientists. This review is of crucial importance in view of the participation of ICIPE consultants, collaborators and scientific representatives of UNDP and international and African agencies and institutions having a particular interest in the work of ICIPE. Additionally, in order to assess and advise ICIPE on its programmes of work, particularly as to the emphasis to be given to research, training and demonstration activities during the project period, each year ICIPE will invite representatives of UNDP, UNEP, the specialized agencies of the United Nations system, donor agencies, African scientific institutions and the international research centres concerned to participate in the open meetings of the ICIPE Governing Board and its Programme Committee, as it deems appropriate. Furthermore, the Support Group for ICIPE, referred to in paragraph 15, commissions a full-scale review once every three years.

20. In order to assess the impact of the project activities, two evaluations will be undertaken, one midway in the course of the project and one at the end. These assessments will be carried out by teams of 2 to 3 independent consultants appointed by UNDP. The findings and recommendations of the mid-project evaluation might necessitate the reorientation or modification of project goals, budgets and work plans for the remainder of the project.

21. As indicated above, UNDP funding has acted as a catalyst for marshalling support from other donors. In earlier years, the UNDP contribution accounted for as much as 64 per cent of the total operating budget. At present, it accounts for 11 per cent of the budget. On the whole, UNDP assistance has sustained the development of ICIPE into a stable institution; more importantly, however, it has enabled the Centre to undertake research in those areas with long pay-off periods; those returns are now beginning to accrue as components of integrated pest control for the benefit of small farmers.

22. The proposed UNDP contribution is $6,200,000 of which $5,900,000 will be for sub-contracts, while direct costs will account for the remaining $300,000. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

III. RECOMMENDATION OF THE ADMINISTRATOR

23. The Administrator recommends that the Governing Council approve this project.

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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Increasing Wheat Production in Warmer and Stressed Environments - Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) (GLO/90/001)

Recommendation of the Administrator

Estimated UNDP contribution: $3,565,000

Duration: Three years

Executing agency: UNDP in association with World Bank and FAO

I. BACKGROUND

1. The Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) grew out of a collaborative programme between the Government of Mexico and the Rockefeller Foundation. The programme, established in 1943, expanded into an international institute in 1966. CIMMYT works with scientists and national programmes around the world on the improvement of maize, wheat and triticale (which is a man-made cross between wheat and rye and has considerable potential for high yields and superior nutritional quality). The first two crops provide the principal sources of calories and protein for approximately half of the world's population. They are the staple foods of some of the poorest people in many developing countries.

2. CIMMYT fulfils its mission in the following ways:

(a) Conducting research in Mexico and elsewhere;

(b) Distributing superior germ-plasm to national programmes for higher and more dependable yields and higher nutritional quality;

(c) Developing procedures for crop improvement and crop management research;

(d) Conducting applied training for scientists from developing countries;

(e) Sponsoring technical seminars and publishing information on new technological components;

(f) Consulting with developing countries on the organization of maize and wheat research programmes;

(g) Assigning specialists to work in regional and national programmes in Asia, Africa and Latin America. CIMMYT serves as the hub of collaborative research with maize and wheat scientists in more than 125 countries around the world.

3. The best-known contributions of CIMMYT are in wheat, with over 35 million hectares in developing countries planted with hundreds of improved varieties emanating from germ-plasm distributed by the Centre. The investment made in the development of these varieties has resulted in an impressive return estimated at approximately $3.0 billion per year. In addition to the contributions in germ-plasm development, CIMMYT has made significant contributions to training wheat researchers in national programmes in developing countries; over 2,000 scientists have been trained in various aspects of wheat improvement during the past 20 years.

4. Wheat accounts for more than one quarter of the total world grain production and is a staple food for one third of the total world population. Since practically all of the world's wheat crop is grown in subtropical and temperate climates, many of the developing countries located in the tropics have to import substantial quantities of wheat. While some of the countries in the tropics, especially in the subtropics, are growing wheat during the drier and cooler seasons, yields are relatively low because of the short growing seasons and damage from insect pests and diseases. Based on exploratory research done by CIMMYT, the United Nations Development Programme (UNDP) has been assisting CIMMYT since 1982 to carry out research on the development of disease- and insect-resistant semi-dwarf wheat varieties which could be adapted to the warmer subtropical areas of the world. The project has assembled and identified different strains of wheat possessing agronomic characteristics suitable for warmer, subtropical regions. These strains have been tested in a number of countries (e.g., Bangladesh, India, Indonesia, Paraguay, Philippines, Sri Lanka and Thailand). Since development of wheat varieties adapted to tropical climates through plant breeding takes a minimum of 10 years, further work is justified on the basis of encouraging results already obtained. Wheat could conceivably be grown in large areas of the world with unfavourable environmental conditions such as acidity, alkalinity, salinity and aluminium toxicity as evidenced from CIMMYT's preliminary screening of certain strains of wheat which appear to be able to withstand the adverse conditions mentioned above. Obviously an expanded effort is required to screen, test and adapt these strains to a number of agro-ecological conditions through a network of co-operators in selected developing countries.

II. THE PROJECT

5. The proposed project addresses the demands of developing countries in the warmer and stressed environments, with emphasis on warmer areas. In conjunction with national programmes, it aims to develop and demonstrate the technology to boost local wheat production in a manner which is economically viable at current world prices, environmentally sound, and complementary with existing traditional crops. The ultimate objective of the project is to bring appropriate countries together in order to increase incomes to farmers and the supply of bread for consumers through increased production in warmer and stressed environments. Stabilization of production through better disease resistance is an important corollary, as is reduction in soil erosion risk in certain regions. Major elements are to:

(a) Develop more productive wheat germ-plasm for warmer and stressed environments. Use of molecular markers in monitoring incorporation of exotic genes and efforts in understanding the physiological basis of heat tolerance are important segments of this project;

(b) Upgrade strength of national agricultural research systems in wheat research through training, visiting scientist programmes, consultancies, workshops, international conferences and publications;

(c) Devise better management for wheat for the above target environments which will lead to sustainable wheat-production systems.

6. Appropriate sums from the total UNDP contribution allocated to the project will be used for biotechnology research to be conducted jointly with selected developing country institutions.

7. Training and visits will directly benefit wheat scientists and decision makers in developing countries. Better germ-plasm and agronomic techniques, partly derived from the global network and partly from their own efforts, will provide the scientists with the wares and the confidence necessary to become involved in technology transfer.

8. Results of the project will be published and disseminated through CIMMYT so as to benefit directly wheat researchers elsewhere with similar problems. Heat tolerant and disease-resistant germ-plasm from warmer areas will be distributed by CIMMYT to its world-wide network of co-operators. It should also be noted that there could be considerable extra benefit if global warming is a reality.

9. The target beneficiaries are those farmers who can take advantage of better wheat technology, especially those with underutilized land in the coolest season, available labour, unused water, and access to inputs. Many hundreds of thousands of farmers have these characteristics. The improved technology must be transferred to them. While some participating countries have good mechanisms for transfer (e.g. Brazil), others have yet to develop them. In those cases, more emphasis will have to be given in training and visits to on-farm research and to building links with extension workers.

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10. The project will continue to operate from two bases, one in South-east Asia (Thailand) and one in South America (Paraguay). There will be a CIMMYT breeder at each location. There will be one agronomist, located in Paraguay. It is anticipated that funds from other sources to Bangladesh and to East Africa will continue to support CIMMYT agronomists working there so that they could also contribute to the work of the project. Support to sub-Saharan African countries in breeding will be strengthened by visits from project team breeders and from CIMMYT headquarters. Candidates from national programmes for training and visits, and locations and topics of workshops and in-country training will be decided jointly by the associated national institutions and the project team in consultation with CIMMYT. The same modality will be used for provision of support to national programmes in terms of short-term consultancies, operational supplies and equipment. The CIMMYT-based programme in Mexico and its core-funded staff in Nepal (in agronomy and pathology) and elsewhere will contribute considerable back-up to the project, especially in germ-plasm improvement. It is estimated that this support amounts to three international scientist man-years per annum. To undertake the required strategic research on the physiology of adaptation to high temperature, a project-funded associate scientist will work in Mexico.

11. The project will be an integral part of the core operations of the Wheat Improvement Programme of CIMMYT, which is expected to receive an estimated $15 million over the next three years from the donor organizations of the Consultative Group on International Agricultural Research (CGIAR). It must be emphasized that much of this assistance will be concentrated on wheat for sub-tropical and temperate climates. Through CIMMYT's international network on wheat, close links will be developed with selected developing country programmes.

12. UNDP will provide the services of a breeder in Paraguay and one in Thailand, an agronomist in Thailand, an associate scientist in Mexico, short-term consultancies, support staff, and institutional support for biotechnology research at selected national institutions. In addition, funds will be provided for the travel of the above people in execution of the project, training, field and laboratory equipment, vehicles, conferences and publications. CIMMYT will be contributing approximately 108 man-months per year towards the execution of this project.

13. The research and training programmes described above - for which full descriptions, including the countries expected to participate, will be made available to UNDP upon project approval - will be implemented by CIMMYT in collaboration with national research institutions of developing countries. As indicated earlier, special conferences, seminars and workshops will be arranged as needs arise. Participants in those events, as well as training courses, will be carefully selected by CIMMYT in consultation with appropriate national agencies.

14. In order to assess the impact of the project activities at the farm level and to measure the effectiveness of the various training programmes, UNDP will provide funds, under its own direct cost component, for the consultancies required in order to undertake an independent evaluation. It is anticipated that such an assessment will be made at two different periods: midway in the course of the project and at the end. Visits will be made to selected countries in order to provide adequate

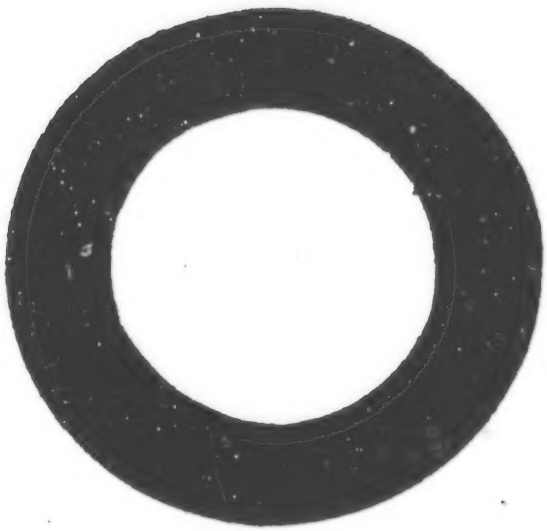
coverage of the countries involved so that the assessment will be meaningful. Special attention will be given in that evaluation to the outcome of the project with regard to strengthening national wheat improvement and extension programmes and the utilization of new technologies by farmers resulting in increased production. The findings and recommendations of the mid-project evaluation might necessitate the re-orientation or modification of project goals, budget and work plans for the remainder of the project.

15. The Administrator intends, through contractual arrangements between CIMMYT and UNDP, to entrust the implementation of this project to CIMMYT with the clear understanding that the Director-General of CIMMYT will seek the advice of the Food and Agriculture Organization of the United Nations (FAO) as needed. As in the past, UNDP will follow closely all of the developments in the global project and, with FAO, will participate in the project advisory committee which will be established. A concerted effort will be made to link the training and research activities with field work being undertaken at the country and intercountry levels. FAO assistance will be sought in implementing national trials and the introduction of new varieties and hybrids as they are developed. The committee, which will include representatives of selected national agricultural research centres, will meet normally once a year, or at such times and places as deemed appropriate by CIMMYT. It will appraise the ongoing training and collaborative research programmes and advise on their future direction. As indicated in paragraph 14 above, towards the end of the project UNDP, in consultation with CIMMYT, will undertake a review of the accomplishments of the project to be carried out by a team of independent consultants.

16. The proposed UNDP contribution is $3,565,000 of which $3,415,000 will be for sub-contracts, while direct costs will account for the remaining $150,000. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

III. RECOMMENDATION OF THE ADMINISTRATOR

17. The Administrator recommends that the Governing Council approve this project.



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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Biotechnology and Conventional Crop Improvement for Sustainable Agriculture in the Semi-Arid Tropics - The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) (GLO/90/002)

Recommendation of the Administrator

Estimated UNDP contribution:	$6,800,000
Duration:	Five years
Executing agency:	UNDP in association with World Bank and FAO

I. BACKGROUND

1. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), established by the Consultative Group on International Agricultural Research (CGIAR) in 1972, deals primarily with the improvement of such food crops as sorghum, millets, chick-peas, pigeon peas and ground-nuts which are grown by small farmers with very limited resources in a harsh environment of depleted soils, erratic rainfall and sparse or no irrigation. This region, which is generally referred to as the semi-arid tropics, covers over 50 countries in Asia, Africa, Latin America and Australia. The main objectives of ICRISAT are to: (a) serve as

an international centre for improving the genetic potential of sorghum, pearl millet, pigeon pea, chick-pea and ground-nut; (b) develop farming systems which increase production through more effective use of available resources; (c) identify factors constraining agricultural development and evaluate ways of alleviating them; and (d) support national and regional research programmes through collaboration, conferences and training.

2. Since its inception ICRISAT has received donor support for its sorghum and millet improvement programmes, both at ICRISAT Centre in India and for its programmes in Africa. ICRISAT has made considerable headway in the development of improved varieties of sorghum and pearl millet. These varieties have been released in Burkina Faso, Ethiopia, Guatemala, India, Kenya, Malawi, Mexico, Myanmar, the Niger, Pakistan, Senegal, the Sudan, Zambia and Zimbabwe. The development of a hybrid sorghum by ICRISAT in association with the national programme of the Sudan was a spectacular achievement, since the variety yields three times that of the local variety.

3. The research programmes of ICRISAT on pigeon pea, chick-pea and ground-nut, as well as farming systems, supported by several donors including the United Nations Development Programme (UNDP), have made notable achievements. Several varieties of the three legumes possessing yield stability, resistance to pests and diseases and the ability to withstand the physical stresses of the semi-arid environment have been developed and released through various national programmes. Excellent international co-operation has been developed through multi-country testing trials, conferences and workshops. ICRISAT is also providing training to large numbers of developing country personnel in all aspects of the improvement of the three legumes and farming systems research. In regard to the latter, ICRISAT has developed strong disciplinary research on the optimum utilization of land, water and other farm resources in order to increase crop production in the resource-poor regions of the semi-arid tropics.

4. Notwithstanding the above accomplishments, there is an urgent need to develop resistance in the crops concerned to various biotic and abiotic stresses. Likewise, further work is needed for developing good production practices for intercropping pigeon pea with sorghum and millet in specific agro-ecological situations in East Africa. The project now proposed would not only build on the achievements noted above, but would also help to develop sustainable systems of production suited to environmental and economic constraints for sorghum, millets and pigeon pea in Asia and Africa.

5. The overall progress and accomplishments of the ICRISAT programmes have been evaluated by a panel of independent consultants appointed by the CGIAR Technical Advisory Committee (TAC). This panel strongly recommended the continuation of external assistance on a long-term basis to permit the expansion of the research and testing activities, together with the enlargement of an intensified training programme to benefit, in particular, those countries where agricultural research systems are still weak. The research and training programmes sponsored by UNDP form an essential and indispensable part of a larger effort of several bilateral and multilateral agencies which are providing substantial inputs of seeds, fertilizers, pesticides and agricultural implements, together with additional

technical assistance, to help build up national capabilities in increasing food production in the countries concerned, with special attention being given to African countries.

6. The research and training programmes outlined in the project now submitted by ICRISAT for UNDP's consideration form one component of ICRISAT's core programme reviewed and endorsed by TAC of CGIAR. The current UNDP-supported global project is scheduled for termination at the end of June 1990. While recognizing the need for further UNDP assistance to ICRISAT, UNDP has encouraged ICRISAT to initiate a research programme involving modern biotechnology in conjunction with conventional crop improvement methods.

II. THE PROJECT

7. The broad objectives of the project are to combine biotechnology and conventional crop improvement techniques to breed improved cultivars with high production potential for sustainable agriculture in the semi-arid tropics, in the face of rapidly increasing populations in this geographic region. The project will enable ICRISAT (a) to transfer finished cultivars and élite breeding materials, (b) to provide techniques of biotechnology for crop improvement to national programmes, and (c) to train national staff with a view to increasing food production in the semi-arid tropics. It is a project of collaboration with and assistance to national agricultural research systems for the ultimate benefit of small farmers of the semi-arid tropics.

8. During the period of the project, emphasis will be on modern biotechnological methods to enhance the efficiency of traditional crop improvement methods. While conventional methods of crop improvement have to remain the main basis for crop improvement and production research, biotechnology will be used where these techniques improve the efficiency of traditional breeding methods or where conventional methods fail. A new biotechnology facility is in operation at ICRISAT Centre. The facility includes laboratories for cereal and legume cell biology, virology, radioisotopy and electron microscopy. These laboratories were set up with funds from other donors.

9. National programmes in China, India, Pakistan, Thailand and Viet Nam in Asia, and Burundi, Ethiopia, Kenya, Rwanda, Somalia and Uganda in Eastern Africa will participate in the project and receive from ICRISAT improved cultivars, information, training and technology associated with cultivation of sorghum, millets and pigeon pea. Since this is a global project, its strategic components will serve all countries of the semi-arid tropics where these crops are grown. The production of sorghum, pearl millet and pigeon pea will increase in all growing regions of the project countries based on better adapted cultivars and new cropping systems. National agricultural research systems scientists with ICRISAT training and participation in workshops, field days and study tours will have better appreciation of inputs and methodology required to produce higher yields and will possess the information, experience and capabilities needed to formulate and extend to growers production technologies giving the best economic returns for particular agro-ecological and socio-economic situations in their countries. Special efforts

will be made to increase women's participation in training, research and field activities. Involvement of private concerns and government organizations in seed industry will be encouraged.

10. UNDP funds will be provided to develop and transfer improved varieties of food crops and the technology relevant to these crops to national programmes. The project will also provide training and technical support to national programmes to make their research efforts more efficient and to ensure that the improved crop varieties will be made available to the farmers through the national extension services. Strong co-operative links will be established with national scientists who will participate in ICRISAT multi-locational testing of crop varieties in order to screen them for adaptation to insect pests and diseases and other environmental stresses in the semi-arid tropics. ICRISAT headquarters in India will provide all necessary backstopping in the implementation of research, training and development activities of the project. The project also provides for appropriate inputs to enable the Food and Agriculture Organization of the United Nations (FAO) to assist in project activities (e.g., facilitating plant quarantine, selection of trainees and dissemination of information).

11. With the increasing population of the semi-arid tropics, the food production gap is progressively widening. Many of the countries of the semi-arid tropics are at present importing substantial quantities of food from abroad. Based on the research results of ICRISAT in several countries of the semi-arid tropics, many of the crops investigated by ICRISAT have substantial yield potential. Improved and staple yields of these crops will provide adequate food, alleviate hunger, overcome malnutrition and generate cash incomes for the small farmers of the semi-arid tropics. UNDP inputs will serve as a catalyst to the core operations of ICRISAT, to which substantial financial assistance will be provided by the CGIAR donor group over the next several years.

12. The research and training programmes described above, for which full descriptions including the countries expected to participate in them will be made available to UNDP on project approval, are to be implemented by ICRISAT in collaboration with national research institutions of developing countries. As already indicated, special conferences, seminars and workshops will be arranged as needs arise. Participants in those events as well as training courses for them will be carefully selected by ICRISAT, in consultation with appropriate national agencies. Specific components of biotechnology research will be carried out jointly with selected national programmes. Appropriate sums from the UNDP funds allocated to the project will be used for this purpose.

13. In order to assess the impact of the project activities at the farm level and to measure the effectiveness of the various training programmes, UNDP will provide, under its own direct costs component, funds for required consultancies in order to undertake an independent evaluation. It is anticipated that such an assessment will be made at two different periods, midway in the course of the project and at the end. The findings and recommendations of the mid-project evaluation might necessitate the reorientation or modification of project goals, budget and work plans for the remainder of the project. Visits will be made to selected countries around the world in order to provide adequate coverage of the countries involved so

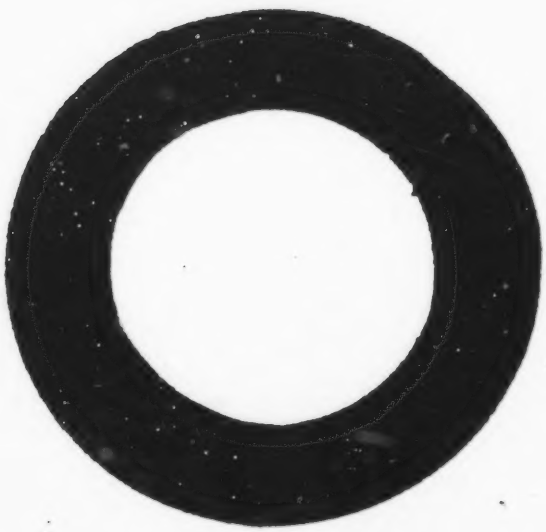
that the assessment will be meaningful. Special attention will be given in that evaluation to the outcome of the project with regard to strengthening national programmes on improvement of the crops concerned as well as extension programmes and the utilization of new technologies by farmers resulting in increased production. Towards the completion of the project, a thorough evaluation of its results and accomplishments will be mounted by UNDP, in consultation with ICRISAT, to be carried out by independent and prestigious consultants.

14. The Administrator intends, through contractual arrangements between ICRISAT and UNDP, to entrust the implementation of this project to ICRISAT, with the clear understanding that the Director-General of ICRISAT will seek the advice of FAO as needed. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO, will participate in the project advisory committee which will be established for the project. A concerted effort will be made to link the training and research activities with field-work being undertaken at the country and intercountry levels. FAO assistance will be sought in implementing national trials and the introduction of new varieties and hybrids as they are developed. The committee, which will include representatives of selected national agricultural research centres, will normally meet once a year, or at such times and places as deemed appropriate by ICRISAT. It will appraise the ongoing training and collaborative research programmes and advise on their future direction.

15. The proposed UNDP contribution is $6,800,000 of which $6,500,000 will be for sub-contracts, while direct costs will account for the remaining $300,000. Direct costs will be used to meet actual expenses incurred by the participation of FAO in the project, mid-project and end-of-project evaluations and project monitoring. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

III. RECOMMENDATION OF THE ADMINISTRATOR

16. The Administrator recommends that the Governing Council approve this project.



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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Research on Development of New Stress-Resistant Maize Genetic Resources - Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) (GLO/90/003)

Recommendation of the Administrator

Estimated UNDP contribution: $6,809,000

Duration: Five years

Executing agency: UNDP in association with World Bank and FAO

I. BACKGROUND

1. The Centro Internacional de Mejoramiento de Maíz y Trigo (CIMMYT) is an autonomous international, non-profit, scientific research and training institution. From its headquarters in Mexico and from offices at a number of other locations around the developing world, the Centre operates a global programme for improvement of maize, wheat and triticale (a cross between wheat and rye), investigates economic issues related to these crops, and provides various forms of support to about 100 national agricultural research programmes responsible for maize and wheat in developing countries.

2. The Centre provides its clients with five primary products and services:

(a) Improved maize and wheat germ-plasm for major production environments in the developing world;

(b) Efficient methods for plant breeding, crop improvement research, and agricultural decision-making, especially in research;

(c) Training of various types;

(d) Scientific information stemming from the Centre's own research and from the work of others;

(e) Consulting services (technical consultation and assistance).

3. Continuing high population growth, negative trends in cereals production, and steady deterioration of the natural resources upon which this production is based have made sustained agriculture the most pressing issue in agricultural research for the developing world. The challenge, according to the Technical Advisory Committee (TAC) of the Consultative Group on International Agricultural Research (CGIAR), is to achieve "successful management of resources for agriculture to satisfy changing human needs while maintaining or enhancing the quality of the environment and conserving natural resources".

4. Significant increases in the maize production of developing countries have been brought about in large part through the development and wide dissemination of new genetic resources and accompanying improved crop management practices. Through a similar combination of technologies, much can be done to help sustain current rates of productivity growth into the next century. A major obstacle to achieving this goal is the lack of stress-resistant germ-plasm, which, if available and widely disseminated, would permit more efficient use of natural resources (and hence their conservation) and help reduce excessive application of potentially harmful chemical inputs. The principal uncontrolled biotic stresses in developing countries are damage caused by various species of stem borers, along with fall army-worm, and the most challenging abiotic stresses are drought, nitrogen deficiency, and aluminium toxicity in acid soils.

5. Sustaining natural resources is 1 of 12 interrelated criteria presented by CIMMYT's strategic plan as a means of assigning priorities to research activities. The plan, which was approved by TAC late in 1988, also endorses the research strategy outlined in this project proposal for generating germ-plasm that will provide maize researchers in developing countries with readily usable sources of stress resistance.

6. CIMMYT's entire strategic plan and research strategy for developing sources of stress resistance draw heavily upon inputs from researchers and administrators in national research programmes. The growing demand for stress-resistant germ-plasm in developing countries (a demand to which this project responds) is a sign of concern about the stability and sustainability of maize production.

7. The immediate beneficiaries of the project will be national agricultural research programmes requesting "source germ-plasm", which comprises combinations of

genes conferring resistance to one or a few critical stresses. In addition to obtaining this powerful tool for improving their contributions to farmers, maize researchers in developing countries will receive a wealth of practical and basic knowledge about the germ-plasm itself and about techniques for improving it. For areas where the source materials are not well adapted, their task will then be to incorporate the source germ-plasm into locally adapted élite germ-plasm to develop final products for release to farmers. The ultimate beneficiaries of the project would be people of developing countries who consume maize directly or indirectly.

8. The major achievement of the maize programme in the past 15 years has been to generate and distribute a wide array of broadly adapted, normal quality protein maize (QPM) germ-plasm for most of the major maize production areas of the developing world. Through research supported by the United Nations Development Programme (UNDP) from the early 1970s to the mid-1980s, the QPM materials were offered to national programmes after the resolution of complex problems with the original opaque-2 germ-plasm. This experience has shown that a well-supported and focused project staffed by plant breeders and other specialists can overcome apparently insurmountable technical barriers.

9. In the past five years, UNDP has supported international testing of improved germ-plasm. An important outcome of this work (apart from gains in the efficiency of production resulting from adoption of varieties and hybrids derived from the Centre's germ-plasm) is that many national maize research programmes have steadily strengthened their research capacity through further improvement of germ-plasm obtained from CIMMYT and through the Centre's training (also supported by UNDP) and other support services. Some programmes, particularly those in Brazil, China, Ecuador, Egypt, Guatemala, India, Kenya, Mexico, the Philippines, Thailand, Turkey and Zimbabwe, are now prepared to embark on technically demanding programmes for incorporating sources of stress resistance into their own élite, locally adapted germ-plasm. The greater skill and experience of researchers in these programmes account in part for their growing interest in receiving this new class of material to try to overcome these production constraints which continue to be impediments.

10. Another source of encouragement for the project proposed here is recent developments at the Centre in research on resistance to stem borers and fall army-worm and tolerance to drought and aluminium toxicity. Innovative entomology research has produced efficient techniques for developing multiple insect-resistant populations. The development of these and additional special purpose populations, as they are termed, has become the central activity of CIMMYT's maize entomology unit. Maize programme physiologists have also met with success in developing five strains that already show high tolerance to drought. In addition, various populations and varieties with tolerance to aluminium toxicity are being developed, improved and distributed internationally for preliminary testing by CIMMYT breeders based in Colombia at the headquarters of the International Centre for Tropical Agriculture (CIAT). Just as important, if not more so than the germ-plasm emerging out of this work, are the insights and techniques derived from it that will permit CIMMYT staff and scientists in national programmes to generate additional sources of resistance.

11. The development of initial sources of stress resistance (in the form of special purpose populations) has proved to be time-consuming and expensive, because of the difficulty of selecting for complex traits. However, new techniques emerging from research in molecular biology, particularly the application of molecular markers, show promise for helping CIMMYT to develop these populations with increased speed, precision and cost-effectiveness over the next 5 to 10 years. At the end of that period, it is expected that readily usable sources of resistance will be in the hands of selected national programmes and that they will be well informed and equipped for handling these materials. They will therefore be able to incorporate resistances into locally adapted germ-plasm.

II. THE PROJECT

12. The primary objective of the project will be to identify and improve for the principal maize production environments of the developing world a wide range of germ-plasm complexes, each of which shows high levels of resistance or tolerance to one or more of the following stresses: stem borers and fall army-worm, drought, low nitrogen levels, and aluminium toxicity in acid soils. Opportunities are seen for advancing this work through the use of molecular markers, mainly in screening germ-plasm for insect resistance and tolerance to drought.

13. More specifically, the project will:

(a) Evaluate possible sources of resistance, including landraces as well as improved maize from around the world, containing biochemical and biophysical resistance or tolerance mechanisms into a population showing good overall agronomic performance; and screen the population for resistance to a pest complex consisting of three stem borers (the species that can be handled in Mexico);

(b) Evaluate agronomic traits such as grain yield, ear length, etc. of maize materials in combination with sources of resistance in various forms in an effort to develop varieties and hybrids;

(c) Evaluate the source materials for resistance to fall army-worm and six stem borer species (the most important ones world-wide) in co-operation with selected national programmes;

(d) Continue promotional work on quality protein maize and its adoption in selected developing countries.

14. The programme of developing germ-plasm tolerant to aluminium toxicity will be conducted through CIAT in Colombia in close co-operation with the national maize programme in Brazil.

15. The project will also try to identify and employ molecular markers for locating genetic segments in maize and tripsacum (a wild relative of maize) that are associated with insect resistance and drought tolerance. This exploratory work will initially be done in co-operation with other national research institutions that possess special competence in molecular biology. CIMMYT has already taken

steps to acquire the capacity to employ molecular markers in the development of stress-resistant germ-plasm. The construction of a biotechnology laboratory complex is nearly complete, staff have been appointed, and CIMMYT has become involved in several projects involving the use of molecular markers. One is a pilot project conducted in co-operation with Mexico's Centre for Research and Advanced Studies (CINVESTAV) designed to enhance yield potential and stability. Another joint project with CINVESTAV is using modern biotechnology techniques to identify genetic segments associated with drought tolerance.

16. The project will establish a system for screening and improving germ-plasm in co-operation with selected developing country maize programmes which will be the primary mechanism for channelling resistant germ-plasm, techniques and information into national programmes. It will also be essential for achieving the other objectives of the project, since information supplied by national programme co-operators on the performance of the germ-plasm is a critical requirement for its further improvement.

17. Finally, the project will work to improve the capacity of national programmes to develop stress-resistant germ-plasm by offering associate scientist positions and visiting scientists' fellowships to outstanding candidates in developing countries. Participants will spend from a few weeks to one year at CIMMYT headquarters, working with project staff on specific aspects of the research with stress-resistant germ-plasm.

18. The global exchange, evaluation and utilization of improved varieties and breeding material would benefit national programmes of several maize-growing countries in Asia, Africa, Latin America and the Caribbean. Improved varieties for unfavourable conditions will greatly benefit the small farmers growing maize in marginal areas. Varietal resistance to biotic and abiotic stresses would, on the one hand, reduce the production costs and, on the other hand, provide a measure of stability to production.

19. The project will be an integral part of the international co-operative programmes of CIMMYT, which are being supported by the CGIAR donor group. CIMMYT thus provides the necessary physical facilities for the execution of the project. The project network links the various national programmes concerned with maize improvement for implementation of the plans. The participating countries for CIMMYT contribute improved varieties and breeding lines to the testing pool and also conduct the trials and exchange the result for mutual benefit. Selected countries offer "hot spot" screening facilities for different stresses under which maize is grown. Any genetic material and technology developed under this project and found promising for the growing conditions in any country would be freely available to all national agricultural research systems for use by farmers in that country by simply acknowledging its origin.

20. UNDP will provide 60 man-months each of a breeder, an entomologist and a physiologist plus junior scientific staff, operational costs and funds for collaborative research with selected national agricultural research systems. Specific components of biotechnology research will be carried out jointly with

selected national programmes. Appropriate sums from the total UNDP funds allocated to the project will be used for this purpose.

21. The Administrator intends, through contractual arrangements between CIMMYT and UNDP, to entrust the implementation of this project to CIMMYT with the clear understanding that the Directorate of CIMMYT will seek the advice of the Food and Agriculture Organization of the United Nations (FAO). As in the past, UNDP will follow closely all the developments in this global project and, together with FAO, will participate in the project advisory committee which will be established for the project. A concerted effort will be made for linking the research activities to be undertaken with field-work being carried out at the country and intercountry levels. The project advisory committee, which will oversee this co-ordination, will include renowned scientists currently engaged in all relevant aspects of maize breeding, genetics, testing and biotechnology research. The committee normally will meet once a year to appraise ongoing research activities and to advise on its future direction. Specialists from other international centres will be invited, as appropriate, to serve on this committee.

22. Midway in the course of the project, UNDP, in consultation with CIMMYT, might decide to schedule an evaluation of the project activities to be undertaken by a team of two or three independent consultants. Such an evaluation could be undertaken in conjunction with one of the project advisory committee meetings mentioned in paragraph 21 above. The findings and recommendations of the mid-project evaluation might necessitate the reorientation or modification of project goals, budget and work plans for the remainder of the project. Towards the completion of the project, a thorough evaluation of its results and accomplishments will be mounted by UNDP, in consultation with CIMMYT, to be carried out by independent and prestigious consultants.

23. The proposed UNDP contribution is $6,809,000 of which $6,609,000 will be for sub-contracts, while direct costs will account for the remaining $200,000. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

III. RECOMMENDATION OF THE ADMINISTRATOR

24. The Administrator recommends that the Governing Council approve this project.

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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Research on Control of Animal Trypanosomiasis through Improved Use of Trypanotolerant Livestock and Vaccine Development - the International Laboratory for Research on Animal Diseases (ILRAD) (GLO/90/004)

Recommendation of the Administrator

Estimated UNDP contribution: $3,050,000

Duration: Three years

Executing agency: UNDP in association with World Bank and FAO

I. BACKGROUND

1. Trypanosomiasis, the sleeping sickness commonly transmitted by the tsetse fly, is a major disease affecting both animals and human beings in developing countries. Together with theileriosis (East Coast fever), it prevents livestock production in vast areas of some 50 countries in Africa, Latin America, the Arab world and Asia. This brings incalculable losses to hundreds of millions of people, including some of the poorest in the world. It means reduced output, not only in meat and dairy products, but in leather, wool, fertilizer and other animal by-products, and in animal power.

2. In Africa, with about 170 million head of cattle and even greater numbers of sheep and goats, the problem is especially severe. Specialists estimate that livestock population could be doubled and in some cases even tripled if trypanosomiasis could be eradicated or kept under permanent control.

3. Chemotherapy and insecticides have been used to control trypanosomiasis in some areas. But these methods are expensive and neither can yet be considered really effective or environmentally safe. Use of the sterile male technique on tsetse flies also remains uncertain and costly. What does seem of potentially great importance is trypanotolerance, through which an animal is able to resist the disease or cure itself of infection. Though it has been known for 80 years that this resistance exists in some breeds of cattle and small ruminants and many species of wild herbivores, little is yet known of its mechanisms.

4. To help develop effective controls for trypanosomiasis and theileriosis, the International Laboratory for Research on Animal Diseases (ILRAD) was established in 1974. It is sponsored by the Consultative Group on International Agricultural Research (CGIAR), a network of international agricultural research centres and programmes supported by Governments, public and private institutions, and international and regional organizations. ILRAD's research has focused on host/parasite/vector relationships which may prove susceptible to immunological control. The disciplines of parasitology, cell biology, biochemistry, molecular biology, immunology, pathology and entomology have all been involved.

5. The United Nations Development Programme (UNDP) has supported ILRAD's intensive basic research since 1978. Objectives have been to develop a vaccine suitable for mass immunization against trypanosomiasis, promote the spread of resistant domestic livestock, improve use of available drugs, and integrate programmes of vector control.

6. ILRAD now possesses the highest capability in Africa for research into trypanosomiasis. Its research programme has resulted in considerable clarification of the problems involved in developing immunological control measures for the disease. It has also shown the importance of the trypanotolerant trait in domestic livestock and provided essential information on its genetic basis. Significant progress has been made in elucidating the mechanisms underlying "antigenic variation", which acts to prevent immune response in many breeds. Success with in vitro (test-tube) cultivation of the three types of trypanosome which cause the disease has opened up entirely new research possibilities. Extensive in vivo (animal) studies have also been conducted with experimental rodents in the laboratory, domestic livestock in field situations, and indigenous African ruminants and species of wildlife with trypanotolerant traits.

7. The research towards improved control of trypanosomiasis is being conducted in collaboration with national African institutions, international organizations including the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), the International Atomic Energy Agency (IAEA), the International Centre of Insect Physiology and Ecology (ICIPE), the International Trypanotolerance Centre (ITC), the Organization of African Unity (OAU) and the laboratories of developed countries.

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8. ILRAD's research programmes on trypanosomiasis and related activities were reviewed by an independent consultant appointed by UNDP in 1984. In October 1985, an external panel of independent specialists commissioned by the Technical Advisory Committee (TAC) of CGIAR also made a comprehensive review of the ILRAD programmes. A similar review conducted in 1989 highly commended the work being carried out by ILRAD and strongly recommended continuation of further support from the international donor community.

II. THE PROJECT

9. The purpose of this project is to intensify research on trypanosomiasis at the genetic and molecular levels, based on results already obtained, in order to devise improved methods for the control of the disease. The capacity of national organizations to carry out relevant research and apply the findings of ILRAD's research will be strengthened by a programme of collaborative research and training and information dissemination. Specific objectives of the project are to:

(a) Determine the genetic and molecular basis of trypanosome differentiation, including the identification of the genes and their products which control this process and host signal molecules which initiate the process;

(b) Delineate the mechanisms of trypanotolerance, including the role of the immune response and the identification of parasite antigens which may represent novel targets for immunization against trypanosomiasis;

(c) Map the areas of the bovine genome responsible for expression of the trypanotolerant trait by examining the heritability of the trait in the progeny of crosses of resistant and susceptible cattle and relating phenotype to both physical and genetic maps of the genes of cattle;

(d) Transfer the information and technology developed at ILRAD and elsewhere to personnel involved in trypanosomiasis control at international, regional and national levels by developing programmes of collaborative research, the issue of scientific publications, reports and newsletters, provision of technical training for both individual and course participants and by organizing scientific seminars and workshops.

10. The benefits of the proposed project will include:

(a) Provision of essential scientific information and data relating to the biology of pathogenic trypanosomes, the diseases they cause in man and animals and the nature of the host responses which contribute towards resistance to trypanosomiasis;

(b) Determination of the feasibility of improving the ability of animals to control trypanosome infections;

(c) Identification of trypanosome antigens which may serve as a basis for immunization against trypanosomiasis;

(d) Provide the means for improving the efficiency of breeding trypanotolerant livestock of improved productive capacity;

(e) Ultimately the development of economically effective, environmentally sound, integrated measures for the control of trypanosomiasis which will improve human health and agricultural productivity in Africa and other regions of the world affected by the disease;

(f) Opportunities for training scientific and technical personnel concerned with trypanosomiasis research and control in countries infested by the tsetse fly and advanced scientific training and the transfer of new technologies to staff of African universities and institutions of higher learning concerned with training future generations of scientists.

11. ILRAD will continue to work closely with the International Livestock Centre for Africa (ILCA) in a large-scale study of the productivity of trypanotolerant livestock in Africa. ILRAD provides training in animal health procedures for ILCA field staff. ILRAD scientists will take an active part in defining the tsetse-trypanosomiasis levels affecting the rearing of livestock under different management systems. Close collaboration will also be maintained with the International Centre of Insect Physiology and Ecology (ICIPE) in Nairobi on various aspects of trypanosomiasis, the International Trypanotolerance Centre in the Gambia, and with national research institutions in African countries, as well as developed country laboratories. Project activities will also be co-ordinated with the WHO/Tropical Disease Research (TDR) Programme.

12. The Programme Committee of the Board of Trustees of ILRAD annually reviews research progress and policy. Provision also exists for the formation of a scientific advisory committee comprised of eminent scientists in disciplines related to the ILRAD research programme when the Programme Committee and the Director-General require specialized advice outside the expertise of Programme Committee members. Representatives of UNDP, FAO and WHO/TDR will be invited to join the annual ILRAD programme committees to review research progress and consider any project alterations required. In addition, representatives of major international organizations and donor countries are invited each year as observers at the Board of Trustees meeting when the report of the Programme Committee is discussed. ILRAD staff also monitor the progress of each research project by twice yearly internal reviews. Towards the end of the project, UNDP, in consultation with ILRAD, will undertake an assessment of the research programme by a team of independent consultants.

13. UNDP funds will be used to provide the following: four senior scientific staff and one training officer; equipment and supplies; and training, including post-doctoral fellowships, in-service training, conferences and workshops, which will receive approximately 30 per cent of the UNDP allocation.

14. UNDP direct costs will be used for financing end-of-project evaluations and contingencies to be made available for special workshops related to animal trypanosomiasis and related activities to facilitate inter-institutional and

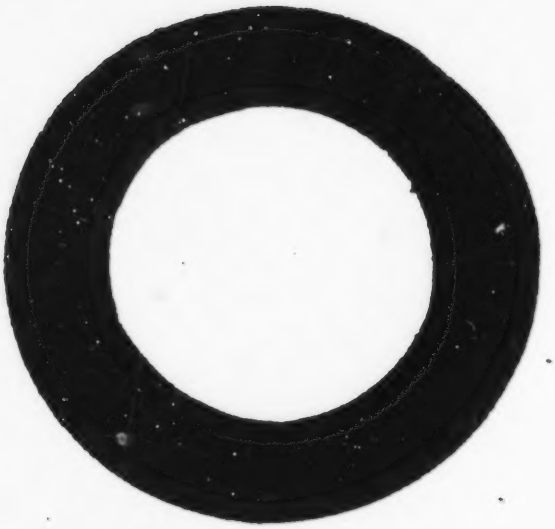
intercountry co-operation. These will be considered strictly on merit on a case-by-case basis and subject to availability of funds.

15. The proposed UNDP contribution is $3,050,000 of which $2,890,000 will be for sub-contracts, while direct costs will account for the remaining $160,000. Financial provision will be made under the direct cost component for the participation of FAO, WHO and IAEA specialists in project advisory committee meetings and in-house reviews and to render other types of assistance which may be required by ILRAD. Details of this collaboration would be worked out between ILRAD and FAO/WHO/IAEA, and actual costs incurred would be reimbursed directly by UNDP to the organizations concerned. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

16. The Administrator intends, through contractual arrangements between ILRAD and UNDP, to entrust the implementation of this project to ILRAD, with the clear understanding that the Director-General of ILRAD will seek the advice of FAO and WHO when needed. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO and WHO, will participate in the advisory committee referred to above.

III. RECOMMENDATION OF THE ADMINISTRATOR

17. The Administrator recommends that the Governing Council approve this project.



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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Fertilizer Strategies for Sustainable Agriculture and Environmental Protection - The International Fertilizer Development Centre (IFDC) (GLO/90/005)

Recommendation of the Administrator

Estimated UNDP contribution: $5,700,000

Duration: Five years

Executing agency: UNDP in association with World Bank and FAO

I. BACKGROUND

1. The use of fertilizer has increased total food production by approximately 30 per cent in developing countries. Its increased use in the future is perhaps the most important means through which developing countries can increase crop production and work towards food self-sufficiency. Improving the efficiency of fertilizer utilization and attacking the constraints that prevent its use go hand in hand with the availability and use of complementary inputs such as water, pesticides, and quality seeds. Fertilizer use is often accompanied by an improvement in cultivation practices, tools, etc., and therefore can be the spearhead of agricultural development. Thus, it has the potential of improving the food supplies and income of the smaller farmers. The training of personnel from

developing countries as well as developed countries is important in identifying fertilizer problems, in transferring technology and in overcoming constraints in production, supply, distribution, marketing and use.

2. The International Fertilizer Development Centre (IFDC) was established in October 1974 on the initiative of the United States Agency for International Development (USAID) and the International Development Research Centre (IDRC) of Canada. By July 1975, IFDC was a functional, private, non-profit organization with headquarters in Muscle Shoals, Alabama. IFDC's buildings constructed with funds from USAID consist of offices, laboratories, a modern training centre, two greenhouses, and space for pilot plants. USAID also furnished grant funds for specialized capital equipment and five pilot plants. IFDC now has the capability for research, development and training in all aspects of fertilizers. In 1977, the United States Government accorded IFDC all of the privileges and immunities granted to international organizations. The Board of Directors of IFDC, which has 13 members at present, includes people from both developing and developed countries, and its members are outstanding in world development efforts, agriculture and fertilizers.

3. Since its inception IFDC has served the fertilizer needs of more than 80 countries around the world and helped to develop the human resources of more than 100 countries by training over 3,500 people in fertilizer production, marketing and use. Through its work, the Centre has helped countries like India, Colombia, Mali, Burkina Faso, Togo, the Niger, Uganda and Zimbabwe find ways to develop their mineral resources to manufacture fertilizers needed to produce more food. Sometimes these resources can be used naturally as they come from the earth while, in other cases, they may need to be improved to make them more effective.

4. IFDC's activities can be divided into three broad categories: (a) collecting and disseminating information on agrominerals; (b) conducting research and development in all phases of fertilizer production, marketing and use; and (c) providing training, advisory services and technical assistance in the planning, organization and implementation of fertilizer production, marketing and use practices. Support from the United Nations Development Programme (UNDP) and other donors has enabled IFDC to become a world-recognized centre on fertilizers with specialists to provide knowledge on various aspects of the fertilizer sector to developing countries. Generation of information is the prime output of IFDC. This information takes many forms: technical bulletins, workshop proceedings, journal publications, training materials and visual aids, special project study reports, and reports to donors. One successful component of information transfer is training provided by IFDC through support from UNDP. From 1979 to 1989 a total of 3,816 participants were trained in all aspects of fertilizer production, marketing and use. Beginning in 1982, there has been a significant increase in the number of women participating in these programmes. UNDP has helped to support agronomic research on nitrogen fertilizer effectiveness in the semi-arid tropics. This has led to a much better understanding of the fate of nitrogen and management conditions under the soil and cropping conditions of the semi-arid tropics area. This work was in collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT).

5. Assistance from UNDP and other donors has enabled IFDC to achieve:

(a) Development of the urea supergranule, which can increase rice production from 30 to 50 per cent above production levels attained with nitrogen fertilizer applied in the conventional manner;

(b) Improvement in the efficiency of nitrogen fertilizers used on upland and lowland crops (rice, sorghum, maize, millet, wheat);

(c) Investigations on means of increasing the potential value of multi-nutrient fertilizers through improvement of their physical and chemical characteristics;

(d) A study indicating means of conserving energy in fertilizer production, distribution and use;

(e) Preparatory work for the African Fertilizer Centre based in Togo.

6. IFDC has been developing strategies for improving the efficiency of fertilizer use so as to minimize the potential harmful effects that high levels of fertilizer use may have on the environment. This is of special relevance to many developing countries because of the anticipated increases in fertilizer prices in the 1990s and the drain that this might cause on the limited foreign exchange resources of these countries. These issues are addressed in the project proposal now submitted by IFDC to UNDP.

7. The project now proposed would take advantage of past achievements but would focus on issues that are emerging as a result of major changes in the fertilizer sector. This new project addresses sustainable agriculture and the role that fertilizers can play in helping to feed a growing population, while at the same time protecting and improving the environment. Both farmers and consumers will benefit from increased food production, and society in general will benefit from a safer environment.

II. THE PROJECT

8. The objectives of the project are to:

(a) Enhance the skills of scientists and policy makers so they are more qualified to make decisions in their respective countries in regard to strategy for producing and using fertilizer for sustainable agriculture on an environmentally sound basis;

(b) Conduct research to develop and evaluate fertilizer use strategies (products and practices) in terms of this potential impact on sustainable crop production and the benefits and costs that such technologies will have for farmers, consumers and the environment;

(c) Generate data through research on potentially hazardous elements in fertilizer raw materials, products and by-products.

/...

9. The project can be viewed as having two major components: (a) human resources development and industrial assessment, and (b) research related to sustainability and environmental issues. Through a series of training workshops, the role of the fertilizer industry in relation to the environment will be assessed. Experiences among developed and developing countries will be shared. Specialized training programmes relating the fertilizer sector to the environment will be provided to representatives from developing countries. Using a network system, the research component will focus on development and evaluation of fertilizer products and management practices as to their impact on sustainable crop production, including benefits and costs for farmers, consumers and the environment. Using data generated, IFDC-developed crop models will be validated and refined. Computer-generated maps will indicate the regions where the technologies have greater potential for adoption and use. IFDC scientists will determine the types and amounts of potentially hazardous elements in fertilizer raw materials and products. The information will be made available to developing countries in workshop proceedings, journal publications, training materials, and other forms as appropriate.

10. In summary, the methodology for implementation of the project consists of the convening of training workshops and group training programmes for participants from developing countries at IFDC headquarters or overseas; one training workshop and up to nine training programmes will be held each year. Special effort will be made to provide professional development opportunities for women in these activities. Fertilizer products and management methods will be field tested, and data will be compiled in relation to use efficiency and environmental impact. Using IFDC-developed models, the regions where the technology is indicated to be appropriate will be delineated. Samples of phosphate fertilizer raw materials and products will be analysed to determine the level of potential harmful elements; the data will be placed in a data base. A publication on the environmental impact of fertilizer production, handling and use will be developed.

11. Close collaboration with national institutions will be a key to implementing this project. Joint programmes will be established with the public and private sectors in Brazil, Colombia, Egypt, India, Indonesia and the United Republic of Tanzania. The activities in these countries will be stipulated in a memorandum of understanding between IFDC and national institutions concerned. The project will also collaborate with agencies of the United Nations system such as the Food and Agriculture Organization of the United Nations (FAO), the United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP). These organizations as well as UNDP and the World Bank will become part of a steering committee to advise IFDC on research, human resources development and related activities of the project.

12. The project will complement several programmes that IFDC is conducting in the developing regions of the world through the inclusion of a "sustainability and environment" perspective. For example, in Africa the project will complement the objectives and activities of other projects such as:

(a) The West Africa Fertilizer Management and Efficiency Network (WAFMEN) involving collaborative research in 14 countries;

(b) The Soil Fertility Restoration Project (SFRP) involving farm and village-level research in Ghana, the Niger and Togo;

(c) A fertilizer evaluation and adoption project in Mali and Nigeria;

(d) Fertilizer policy and marketing research currently conducted in several countries of East and West Africa;

(e) Agromineral resource documentation and evaluation in east/south-east Africa and west Africa done through a network of collaborators in these regions. These projects are funded by UNDP, USAID, IDRC and the Governments of the Netherlands, France and the Federal Republic of Germany.

13. The project will also complement:

(a) IFDC's basic and adaptive research that is being conducted to enhance fertilizer use efficiency and the utilization of indigenous resources for fertilizer use in developing countries;

(b) IFDC's collaborative research with international centres such as the International Rice Research Institute (IRRI), the International Centre for Tropical Agriculture (CIAT) and ICRISAT.

14. The research and training programmes described above, for which full descriptions and detailed requirements will be made available to UNDP on project approval, will be implemented by IFDC in collaboration with appropriate organizations in the developing countries (e.g., national and international centres of agricultural research). Special conferences, seminars and workshops will be arranged as needs arise. Participants in those events as well as training courses will be carefully selected by IFDC in consultation with the national and international agencies.

15. The project will be an integral part of the international and regional programmes of IFDC, supported by various donors. The Centre has in place the facilities for execution of the project. IFDC has established the necessary contacts within the national and international community to allow it to complement the project. The project fits into the overall mandate of IFDC, namely, to transfer fertilizer-related information and technology to developing countries for agricultural development.

16. The Administrator intends, through contractual arrangements between IFDC and UNDP, to entrust the implementation of this project to IFDC, with the clear understanding that the Director-General of IFDC will seek the advice of FAO, UNIDO, UNEP and the World Bank. As in the past, UNDP will follow closely all the developments in this global project and, together with FAO, UNIDO, UNEP and the World Bank, will participate in the project advisory committee which will be established for the project. A concerted effort will be made to link the training and research activities with field-work being undertaken at the country and intercountry levels. Close collaboration will be maintained at all times with the international agricultural research centres participating in the project. The

committee, which will include representatives of selected national agricultural research centres, will normally meet once a year to appraise the ongoing training and research programmes and advise on their future direction. In order to assess the impact of the project activities, two evaluations will be undertaken, one midway in the course of the project and one at the end. These assessments will be carried out by teams of 2 to 3 independent consultants appointed by UNDP. The findings and recommendations of the mid-project evaluation might necessitate the reorientation or modification of project goals, budget and work-plans for the remainder of the project.

17. The proposed UNDP contribution is $5,700,000 of which $5,500,000 will be for sub-contracts, while direct costs will account for the remaining $200,000. Direct costs will be used for participation of United Nations agencies in the project, mid-project and end-of-project evaluations and UNDP project monitoring. The expenditures under the project through 1991 will be contained within the indicative planning figure (IPF) for global projects established by the Governing Council for the fourth cycle. The expenditures covering the remaining period of the project will be subject to approval of the fifth cycle IPF commencing 1 January 1992.

III. RECOMMENDATION OF THE ADMINISTRATOR

18. The Administrator recommends that the Governing Council approve this project.

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PROGRAMME PLANNING

COUNTRY, INTERCOUNTRY AND GLOBAL PROGRAMMES

Assistance for a global project

Strengthening of Primary Health Care: Development of New Tools for Disease Prevention and Control (GLO/90/007)

Recommendation of the Administrator

Estimated UNDP contribution: $6,000,000

Duration: Four years

Executing agency: World Health Organization (WHO)

I. BACKGROUND

1. One of the most cost-effective approaches to controlling major infectious diseases affecting children in the developing world is the extended use of appropriate vaccines. Thus, the establishment of national expanded programmes on immunization (EPI) plays an essential role in the fight against these diseases. National EPI programmes are today providing immunization against six major childhood diseases to more than 50 per cent of infants in developing countries. There is still much more to be accomplished, however. No vaccines exist at present to protect against acute respiratory viral infections, dengue and viral hepatitis, other than hepatitis B, and these are diseases which cause several hundred million cases annually. Currently available vaccines against poliomyelitis, tuberculosis and measles are not optimally adapted to conditions prevailing in developing countries. Vaccines requiring repeated injections, such as those against tetanus, diphtheria, pertussis and hepatitis B, make achievement of complete vaccine

coverage both difficult and expensive. There is also an urgent need to increase the heat stability of all vaccines for current or future use in EPI which at present require a cold-chain system. Solutions to these problems lie in continued research towards developing new vaccines and improving the efficacy of existing vaccines. The development of biotechnology has been until now centred on the interests of developed nations. The stage has now been reached where it is possible to envisage short-term and medium-term benefits from applying biotechnology to health problems of developing countries. It may be expected that within 10 years most current and future vaccines used in EPI will be based on biotechnology. Also by-products of the vaccine development efforts will allow the transfer of new diagnostic approaches to developing countries for diseases in which case-detection is essential for control (e.g., tuberculosis). The resulting improvement in the ease of vaccine delivery will have a very significant impact on reducing the cost of disease prevention and, in the long term, on the economic burden represented by those diseases. While such efforts are under way, more research is needed to improve strategies to reduce the estimated 3 million childhood deaths occurring each year due to the acute respiratory infections (ARI) that are not preventable by existing vaccines. Emphasis must be particularly directed towards developing and improving approaches utilized in the delivery of the ARI case management strategy. This strategy, if appropriately followed when assessing and treating acute respiratory infections, can result in reduced mortality and ensure more effective use of available resources, thus strengthening primary health care.

2. The efforts on the part of the World Health Organization (WHO) and collaborators to develop new vaccines, improve existing vaccines and refine the ARI case management strategy need to be closely co-ordinated. This programme, by identifying research priorities, stimulating initiatives and improving methodologies, will result in a strengthened global research effort. It will support two WHO programmes, namely, the Programme for Vaccine Development and Transdisease Vaccinology (PVD) and the Programme for the Control of Acute Respiratory Infections. The programme will also enhance the capabilities of supported institutions to undertake research. The importance of new and improved vaccines and disease control strategies was stressed during a recent meeting organized by the Task Force on Child Survival entitled "Protecting the World's Children: A Call for Action" (1-3 March 1990, Bangkok, Thailand). Among the participants in the meeting were the heads and other senior officials of the United Nations Development Programme (UNDP), WHO, the United Nations Children's Fund (UNICEF), the World Bank and the Rockefeller Foundation (members of the Task Force) as well as high-level officials from Governments and other agencies.

II. THE PROJECT

A. Programme for Vaccine Development and Transdisease Vaccinology

3. The major emphasis of the Programme for Vaccine Development and Transdisease Vaccinology (PVD) is on the prevention of major killing infectious diseases in developing countries through the development of new vaccines. More than 10 million children still die each year from infectious diseases in the developing world.

Some of these diseases are preventable by vaccination at an early age. This is the case for poliomyelitis, diphtheria, tetanus and measles. The impact of these vaccines largely depends on the extent of the vaccine coverage achieved in populations at risk. Considerable progress has been made in the last 10 years by national EPI programmes. However, there are three main vaccine-related factors which limit the present impact of immunization and for which targeted research has been initiated:

(a) A number of existing vaccines cannot offer optimal protection in the environmental and epidemiological conditions encountered in many developing countries (e.g., measles, poliomyelitis, meningitis, tuberculosis). Measles is still killing 1.5 million children per year, often before the age at which existing vaccines can be given and there is no possible chemotherapy.

(b) No vaccine yet exists to protect against some of the major infectious diseases which prevail in developing countries (e.g., acute respiratory viral infections, dengue, viral hepatitis non-A and non-B). Acute respiratory viruses account for 40 per cent of acute respiratory infections below one year of age and there is no available therapy.

(c) Many existing vaccines require repeated administration, often by injection. This is very costly owing to the need for trained personnel and the appropriate material. It is also a major cause of drop-outs from vaccination programmes. In many areas, between 30 and 50 per cent of children who receive a first dose of vaccine do not complete the course of immunization and are therefore not fully protected.

4. The Programme for Vaccine Development was established in 1984 with the aim of exploiting recent advances in biotechnology and immunology to generate new vaccines and to fill the gap in the prevention of those major infectious diseases for which there was an urgent need for appropriate or improved vaccines. The diseases selected as targets for PVD were chosen because of their importance as public health problems in developing countries and the lack of co-ordinated research efforts towards the development of corresponding vaccines. In 1988, a new component was added to this programme, i.e., transdisease vaccinology: laboratory research directed towards improving the immune response to vaccines, developing single-dose and oral vaccines and improving the heat stability of vaccines. Success in this effort will lead to improved and more effective population coverage by EPI programmes at a reduced cost. The consequent reduction in disease and premature death will ease the disease burden on health authorities in developing countries and eventually contribute to the development process in many countries. The Programme's general approach has been to support basic research, develop new vaccines and improve existing vaccines using the most recent developments in biotechnology and immunology. Specific approaches are adapted to each target disease. Usually, recombinant DNA technology, peptide synthesis and epitope analysis are applied to the isolation, characterization and production of antigens with potential protective value. In parallel, genetic engineering is applied to the generation of live vaccines. By-products of these research efforts are new immunological reagents or nucleic acid probes, which represent useful tools for the rapid diagnosis of these diseases.

5. The Programme is managed by the Division of Communicable Diseases in WHO. For each type of vaccine, research projects are co-ordinated and assessed by independent steering committees and the general orientation of the Programme is reviewed annually by the Scientific Advisory Group of Experts (SAGE). Representatives of UNDP and interested Governments are invited to attend the meetings of SAGE.

6. In July 1989, the research priorities and the achievements of the Programme were assessed by an external review committee. The committee acknowledged the remarkable achievements made during the first phase of the Programme and strongly recommended its continuation at a higher level of funding.

Specific activities and expected impact

7. Specific activities envisaged under the Programme for Vaccine Development and Transdisease Vaccinology, and their expected impact are outlined below.

(a) Selection of priorities. Priorities are selected on the basis of:

(i) Epidemiological studies indicating the major health importance of preventing certain diseases in developing countries;

(ii) The lack of interest on the part of industry in the development of vaccines against certain diseases;

(iii) The cost-benefit and the expected effectiveness of prevention through vaccination as compared to chemotherapy.

(b) Improvement of existing vaccines

(i) In poliomyelitis new vaccines should greatly facilitate the achievement of the goal to eradicate the disease on a world-wide basis by the year 2000. New polio vaccines that will be developed will be more resistant to heat, thus reducing the requirement and cost of cold-chains. They will be more immunogenic and will have a reduced tendency to revert to virulence, thus avoiding the replacement of naturally acquired polio by vaccine-induced polio.

(ii) In tuberculosis the availability of an improved BCG vaccine and of new disease-specific laboratory diagnostic tools will markedly contribute to the control of the infection, which is still killing 3 million persons annually. In addition, a newly engineered BCG would be able to carry additional gene coding for other vaccines and represent an effective multivalent vaccine produced at a low cost.

(iii) The availability of vaccines against bacterial meningitis which would be effective in children under the age of two years would allow for the prevention of epidemics of bacterial meningitis, together with endemic cases which are recurrent in many areas of the developing world. The technology developed for such vaccines would also be applicable to the

prevention of bacterial pneumonia due to Haemophilus influenzae or pneumococcal infections, which represent the major cause of child death in most of the developing world and are of particular concern to the Programme for the Control of Acute Respiratory Infections.

(iv) The development of a measles vaccine effective at one to four months of age would have a profound impact on child survival.

(c) New vaccines against "forgotten" viral diseases to be added to EPI. The Programme is equally involved in the development of new vaccines. Three groups of viral and bacterial diseases, described below, have been given priority in view of their global importance or of their high prevalence in a significant number of developing countries. The general approach used for the development of each vaccine has a number of common features: characterization of the viral genome, definition of molecules appearing as potential protective antigens, production of these antigens by recombinant-DNA technology and engineering of attenuated viruses as candidate vaccines. The development of vaccines against acute respiratory viral infections caused by respiratory syncytial viruses (RSV) or parainfluenza 3 viruses will considerably affect infant morbidity and mortality throughout the world. Vaccines against dengue will have a great protective value for approximately 60 million people each year and would prevent deaths from the dengue-associated hemorrhagic shock syndrome. The impact of development of vaccines against viral hepatitis will also be considered. The lethality associated with enterically-transmitted hepatitis (non-A, non-B) would be decreased by the availability of vaccines against those viral agents. At the time of writing, consideration is being given to the possibility of including diarrhoeal disease vaccine development in PVD.

(d) New vaccine delivery systems to reduce cost and improve coverage of EPI. Neonatal tetanus is still killing 780,000 neonates annually. This disease can be prevented by vaccination of pregnant women or of women of child-bearing age. However, the requirement for repeated injections with the existing tetanus vaccine is a factor particularly limiting the immunization coverage, and the development of a one-shot tetanus vaccine will significantly improve the control of this disease. The same technology will later be used for other vaccines included, or considered for inclusion, in EPI (DPT, poliomyelitis, hepatitis B). This will lessen the number of contacts needed for EPI coverage and therefore result in a decrease in the cost of immunization. On the basis of the data available in 1988, the savings achieved by decreasing the number of injections for one or more vaccines can be estimated to be from $20 million to $95 million annually, on a world-wide basis (developing countries). Finally, by promoting the development and improvement of oral vaccines, it will be possible to change the mode of delivery for current (and future) EPI vaccines from injection to oral administration. Oral vaccines provide a cheaper alternative to injections because there is less need for trained personnel to administer them; no need for a sterilized environment in administration of the vaccine and disposal of the administering equipment (a syringe in the case of injections); no longer a need for certain equipment (e.g., syringes); and fewer complications. Therefore, the extended use of oral vaccines would certainly further reduce the cost of national immunization programmes.

(e) Co-operation with other WHO programmes. The Programme for Vaccine Development and Transdisease Vaccinology (PVD) is closely collaborating with:

(i) Other disease control programmes interested in using the newly developed vaccines: Expanded Programme on Immunization (EPI), Control of Acute Respiratory Infections (ARI) and Diarrhoeal Diseases Control (CDD). Staffs of these programmes are always involved in the selection of priorities and optimal strategies. Similarly, members of PVD are invited to meetings of the EPI research and development group, of CDD and ARI. There is an intra-secretarial committee for the co-ordination of vaccine-related activities throughout WHO.

(ii) Other programmes which have a vaccine development component: the UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases, and the Special Programme of Research, Development and Research Training in Human Reproduction. Members of PVD are participating in all meetings related to vaccine research in these programmes.

Results obtained in the first phase of the Programme

8. PVD has been particularly efficient in promoting collaborative research on an international basis, with results of considerable practical importance. Since 1988, the preparatory assistance of UNDP has been of great help to accelerate this progress, as evidenced by the following:

(a) New vaccines have been developed and are already at a trial stage: acute respiratory viruses (phase 1 in humans), and meningitis A-C (pre-clinical trials);

(b) The molecular basis for engineering a new heat-stable and safer polio vaccine has been established;

(c) The elucidation of the fine structure of dengue viruses has opened the way to the preparation of the needed multivalent vaccine;

(d) The preparation of a single-dose, controlled-release, tetanus vaccine is in progress.

B. Programme for the Control of Acute Respiratory Infections

9. The acute respiratory infections (ARI) rank among the most common diseases the world over. Everywhere they represent either the first or the second cause of visits to health services by young children. Their impact, however, is far more serious in developing than in developed countries. While the annual incidence of pneumonia, the most severe manifestation of acute respiratory infections, is 3-4 per cent in children under five years of age in developed countries, levels are as high as 80 per cent in developing countries, especially in rural areas where relevant risk factors such as malnutrition and low birth weight are highly prevalent. Furthermore, in developing countries, pneumonia is mostly caused by

bacteria and is associated with high case-fatality and mortality rates. Of the estimated 15 million deaths occurring each year in children under five years of age, 25-30 per cent are due to acute respiratory infections, and the vast majority of these are caused by bacterial pneumonia. Thus, in absolute numbers, pneumonia accounts for about 4 million childhood deaths annually.

10. The major emphasis of the WHO Programme for the Control of Acute Respiratory Infections is on the proper treatment of all ARI, which should result, above all, in the prevention of death from pneumonia. It should also lead to a more rational use of antibiotics and other remedies for treatment of ARI, since these comprise 30-50 per cent of all drugs used in the public and private sectors. A second emphasis is on the reduction of the incidence of ARI. Both can be achieved through the establishment of well-managed ARI control programmes. Because of their potential impact on mortality in children, programmes for the control of such infections must be an essential part of broad primary health care and child survival programmes. They need to be complemented also by an extensive research and development effort to develop new and improved tools and approaches, which should be closely linked to the goals of national ARI control programmes.

11. The Programme's research priorities were discussed and redefined by the 4th meeting of the Programme's Technical Advisory Group (TAG) in March 1989. The immediate goal of the research component is the development and evaluation of new or improved intervention measures appropriate in reducing morbidity and mortality due to acute lower respiratory infections (especially pneumonia), since these are, in contrast with the upper respiratory infections, the main causes of severe morbidity and mortality. TAG requested that the Programme consider a limited number of focused priorities and address, as a first priority, the important questions that remain with regard to delivery of the ARI case management strategy.

12. The initial contribution by UNDP (1988-1990) to the Programme for the Control of Acute Respiratory Infections played a major part in the development of its research component. It enabled the Programme to convene meetings of experts in various disciplines to establish broad priorities for support of research, to identify institutes in the developing world interested in undertaking this research, to establish a peer review mechanism for reviewing research proposals, and to initiate support for field projects.

Main areas of research

13. The following is a summary of the priority research planned to be supported through the Programme in four main areas: clinical, behavioural, health systems and disease prevention research:

(a) Clinical research will be concerned with the evaluation and development of improved technical guidelines for the clinical management of ARI cases, particularly pneumonia. Studies are under way to determine the most accurate means of counting the respiratory rate in young children; these are critical since rapid breathing is the most important sign of pneumonia and is the basis for the WHO case management protocol. In infants aged less than two months, where ARI mortality rates are highest, studies will be undertaken to determine a simple set of clinical

signs with a high sensitivity, specificity and predictive value for pneumonia or other serious bacterial infection. Aetiological data will also be obtained to determine optimal therapeutic regimens and to direct future vaccine-related research. A multi-centre study to answer these questions will be carried out in 1990-1991 using a common protocol in institutes in the Gambia, Ethiopia, Haiti, the Philippines and Papua New Guinea. Studies will also be initiated to determine: clinical signs of severe pneumonia or other related severe disease which would benefit from hospitalization; clinical signs and aetiologic agents of pneumonia in severely malnourished children; methods of oxygen delivery suitable for district-level hospitals; and treatment of wheezing at first-level facilities. It is of primary interest to conduct evaluations of simplified and shortened antibiotics regimens, to establish the relative efficacy of alternative antibiotics, to determine the efficacy of recommended antibiotics regimens in high risk groups such as very young infants and severely malnourished children, and to study methods to improve mothers' compliance with oral antibiotics administered at home. The outcome of these studies will be simplified and effective guidelines drawn up for treatment of all ARI cases, applicable by staff working in first-level health facilities and district hospitals, as well as by community health workers.

(b) Of critical importance to the case management strategy is the early case detection and prompt treatment of pneumonia cases. Behavioural research is needed to obtain information on mothers' ability to recognize signs of pneumonia, the sequence and timing of their care-seeking and their compliance with treatment advice. It is also required to identify the signs that mothers recognize as severe and to determine their relationship to clinical pneumonia. This information will assist control programmes in designing messages to mothers about effective home care advice; in identifying maternal expectations concerning antibiotic and other drug therapy; in anticipating problems with antibiotic treatment compliance; and in assisting national ARI programme staff and health workers in understanding relevant cultural characteristics and conditions that are likely strongly to influence community responses to programme activities. In order to obtain this information the Programme is developing a rapid ethnographic assessment protocol. This will be field tested in at least five countries during 1990-1991 and then made available to all ARI programmes. In addition, ethnographic studies will be undertaken to identify significant and modifiable behavioural risk factors that influence the incidence, severity and outcome of pneumonia. Such research may provide important information on how pneumonia can be prevented.

(c) Health systems research includes continued development of three types of appropriate technologies important for national ARI programmes, namely, sounding timers, portable oxygen concentrators, and footpump rebulizers. The availability of a reliable, robust and accurate sounding timer will allow health workers to count a child's respiratory rate accurately without diverting attention from close inspection of the child's breathing. The development of a suitable portable oxygen concentrator will save the lives of many children with severe pneumonia who require oxygen in addition to antibiotic therapy. Footpump rebulizers are needed to treat wheezing children more effectively in an outpatient setting with bronchodilators. Within four years all these technologies should be sufficiently developed to be made widely available to national ARI programmes. Health systems research will also include studies that address the feasibility, efficiency and effectiveness of

national ARI programmes. Correct performance will be assessed by systematic use of evaluation instruments being developed for national programmes (e.g., health facility survey, household morbidity and treatment survey) and by special studies and surveillance methods. In order to develop reliable survey instruments, research will be undertaken to validate interview techniques for detecting pneumonia episodes and deaths. These studies will also address the use of antibiotics when given to community health workers specifically for treatment of pneumonia. These will be complemented by studies to determine the simplest method for monitoring antibiotic resistance of H. influenzae and the pneumococcus in the population, since the potential emergence of such resistance is one of the major concerns in allowing these antibiotics to be distributed by community health workers.

(d) It is recognized that certain risk factors of a biological (e.g., low birth weight and malnutrition), environmental (e.g., indoor air pollution) or behavioural nature may determine the incidence and severity of pneumonia. Disease prevention research will assess potentially important risk factors for pneumonia in young children and relate their presence to precisely defined outcome measurements which are congruent with those used in other clinical studies. In addition, beginning in 1990, the Programme will undertake a review of the feasibility and cost-effectiveness of several potential preventive interventions. This will help to identify other areas of research which are likely to lead to the development of feasible programme strategies for the prevention of pneumonia. Disease prevention research will also include support for field trials of available vaccines being developed by PVD against the main cause of lower respiratory tract infections. At present, vaccines against H. influenzae type B and the pneumococcus are the most likely to be available for field testing. Protein-polysaccharide conjugate vaccines against H. influenzae type B have recently become available and shown to be immunogenic in infants in both developed and developing countries. The Programme is now participating in preparation of a formal proposal to initiate surveillance for this disease in the western region of the Gambia in 1990, and plans to support a vaccine trial there using the most suitable candidate vaccine in 1991 or 1992. Developments in the production of pneumococcal conjugate vaccines will be closely followed, with the intention of having a candidate for testing in 1992 or 1993, possibly also in the Gambia.

Training and institution strengthening

14. The strengthening of research capability in vaccinology and immunology of infectious diseases in the Programme for Vaccine Development and Transdisease Vaccinology is based on a training programme comprising:

(a) Two annual 5-8 week courses (one in French, one in English) for 45-50 participants from developing countries, organized in the Geneva/Lausanne WHO Research and Training Centre;

(b) "Refresher" courses at regional level (e.g., 1989 India, 1990 Costa Rica, 1991 Brazil, Gabon);

(c) Follow-up visits by consultants and staff to previous participants in the training programme;

(d) Transfer of technology to developing country laboratories associated with the Programme in Africa, Latin America and Asia (fellowships, site visits); this transfer of technology aims to:

(i) Favour the direct involvement of scientists from developing countries in vaccine development;

(ii) Establish the basis for field evaluations of immunogenicity and protective efficacy of new vaccines;

(iii) Prepare the transfer of vaccine production to developing countries;

(e) The training programme will also strengthen institutions in developing countries through increasing the number of scientists capable of conducting the epidemiological research essential for effective vaccine trials.

15. The Programme for the Control of Acute Respiratory Infections will develop research-capability strengthening activities closely tied in with the above-mentioned training programmes.

Funding

16. In view of the high mortality and morbidity caused by the selected diseases, UNDP and WHO are seeking additional support from other donors in order to speed up the research efforts for the sake of preventing and controlling diseases, saving more lives and lessening sickness as soon as possible. To date, support for vaccine development/transdisease vaccinology has been provided by the following countries and organizations in addition to WHO and UNDP: Australia, Italy and Norway, as well as the Japan Shipbuilding Industry Foundation, the Pew Charitable Trusts, the Rockefeller Foundation and the Swedish Agency for Research Co-operation with Developing Countries (SAREC). Funding for control of acute respiratory diseases has been provided by the following countries and organizations in addition to WHO and UNDP: Australia, the Federal Republic of Germany, Finland, Italy, Japan, the Netherlands, Sweden, the United Kingdom of Great Britain and Northern Ireland and the United States of America, as well as the Arab Gulf Programme for United Nations Development Organizations (AGFUND), the Kellogg Foundation, the Sasakawa Health Trust Fund and the United Nations Children's Fund (UNICEF). Despite this widespread interest from donors, the level of funding is not yet commensurate with the potential impact of these disease prevention and control measures.

Summary

17. The aim of these initiatives is to reduce the very high morbidity and mortality due to infectious diseases, particularly respiratory infections occurring in a considerable number of children in developing countries. Three levels of activities are involved: first, research to develop new and improved vaccines with particular emphasis on those diseases which cannot be treated with antibiotics or antivirals. It will also comprise the development of vaccines easier to deliver than those used at present in EPI; secondly, research on case management of acute

respiratory infections centred on optimal strategies to control those infections and to develop new methodologies in a strengthened global effort; and thirdly, strengthening of research capability in developing countries.

18. Active support will be sought from other bilateral and multilateral agencies, from foundations and from the private sector.

19. The proposed UNDP contribution is $6,000,000 for four years.

III. RECOMMENDATION OF THE ADMINISTRATOR

20. The Administrator recommends that the Governing Council approve the project entitled Strengthening of Primary Health Care: Development of New Tools for Disease Prevention and Control (GLO/90/007).